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April 8, 2004

BY HAND AND BY E-MAIL

Mary L. Cottrell, Secretary
Department of Telecommunications and Energy
One South Station, 2nd Floor
Boston, MA 02110

Re: NStar Companies, D.T.E. 03-121

Dear Secretary Cottrell:

Enclosed for filing in the above-entitled action is Response of the Joint Supporters to NSTAR Electric Second Set of Information Requests to the Joint Supporters.

Please acknowledge receipt by stamping the enclosed copy of this letter and returning it to the messenger. Thank you.

Sincerely,

Bruce S. Barnett

BSB/lnf
Enclosure

cc: William Stevens, Hearing Officer (by hand)
John Cope-Flanagan, Hearing Officer (by hand)
Sean Hanley (by hand)
Claude Francisco (by hand)
Xuan Yu (by hand)
Robert Harrold (by hand)
David S. Rosenzweig, Esq. (by hand)
D.T.E. 03-121 Service List (By U.S. mail or e-mail)

Information Request NSTAR-JS-2-1

Referring to page 8, lines 161-167, please provide all studies, reports and analyses quantifying DG's reduction in locational marginal price and the "benefits to the community" described.

Response

Mr. Lively believes that the California electricity crisis of 2000-2001 is applicable. However, Mr. Lively has no specific study, report, or analysis in his possession quantifying the reduction in locational marginal price due to the presence of distributed generation. At least part of the problem is that electric utilities like NSTAR Electric have been too recalcitrant to install locational marginal prices on their distribution system.

The California electricity crisis is applicable since generation operators there were faulted for "economic withholding." One form of "economic withholding" involves shutting down generators for the purpose of increasing the locational marginal price of electricity. There have been many complaints about generators engaging in economic withholding during the California electricity crisis of 2000-2001. Some of these complaints have led to multimillion dollar financial settlements with FERC staff. The economic withholding supposedly increased the cost to the California electric community. Web searches on economic withholding also identify economic withholding as an issue with the New York ISO.

Economic withholding would be similar to DG deciding not to generate in order to prevent a "reduction in locational marginal price" and to eliminate "benefits to the community." That there are benefits to the community is demonstrated by the settlement of the California complaints at a high economic cost to the generators. This is the example of the issue that Mr. Lively raised on lines 161-167 of his testimony.

Information Request NSTAR-JS-2-2

Referring to page 12, line 262, please define "costly" as used in this question and answer. Is costly understood in the context of dollars/kWh, dollars/kW of peak demand, total monthly or annual delivery cost, or some other measure?

Response

As is discussed in the answer,

> But there are a variety of costing mechanisms, and for other costing mechanisms these same customers with distributed generation have load patterns that may be considered to be less costly than the load patterns of customers without distributed generation. Thus the result may depend more on the choice of the costing mechanism than the load pattern of the customer. (Lines 266-271, Direct Testimony of Mark B. Lively, D.T.E. 03-121)

So there are a variety of ways to define "costly". Mr. Lively has not limited himself to a single precise definition of costly.

Information Request NSTAR-JS-2-3

Referring to page 12, line 276, please define in detail the "costing mechanism" that is cited.

Response

Mr. Lively notes that the full sentence from which was taken the term "costing mechanism" reads.

> And the cost incurrence will depend on the choice of costing mechanism. (Lines 275-276, Direct Testimony of Mark B. Lively, D.T.E. 03-121)

Mr. Lively also notes that the predicate to this response is the following sentence in the prior answer from his testimony.

> Thus the result may depend more on the choice of the costing mechanism than the load pattern of the customer. (Lines 270-271, Direct Testimony of Mark B. Lively, D.T.E. 03-121)

Accordingly, the request to "define in detail the 'costing mechanism' that is cited" is inappropriate since the reference is to a generic concept. Mr. Lively notes that there are several groups of costing mechanisms that have been accepted by utility commissions, including embedded cost and marginal cost. Further, within each of these groups of costing mechanisms, there are many variations that will change the concept of which group of customers is more costly than other groups of customers.

Information Request NSTAR-JS-2-4

Referring to page 13, lines 289-303, is it Mr. Lively's position that a customer's annual billing demand ratio is the appropriate measure of the similarity of customers' load profiles for purposes of identifying differences in the cost of providing distribution service? Please explain.

Response

It is Mr. Lively's position that, in the absence of load data or costing analysis, annual billing demand ratio is a reasonable piece of circumstantial evidence from which can be inferred differences (or the lack thereof) in the cost of providing distribution service to different groups of customers. It is also Mr. Lively's position is that NSTAR Electric should have presented an affirmative case in this proceeding showing the costs to serve customers with distributed generation relative to the cost to serve customers without distributed generation, including providing the appropriate load research and costing analysis.

Since NSTAR Electric failed to present an affirmative case on the difference, if any, in the cost to serve customers with distributed generation relative to the cost to serve customers without distributed generation, including providing the appropriate load research and costing analysis, other parties must turn to circumstantial evidence such as annual billing demand ratio.

Information Request NSTAR-JS-2-5

Referring to page 13, lines 289-303, is it Mr. Lively's position that customers with similar billing demand ratios should pay the same distribution rates? Please identify what definition of "billing demand" Mr. Lively is relying upon as the basis for the response to this information request and as the basis for Mr. Lively's prefiled testimony.

Response

No. As stated in Response NSTAR-JS-2-4, Mr. Lively believes that the similarity in billing demand ratio between DG and non-DG customers, as set forth in Elaine Saunders' testimony, tends to show that costs of serving the two groups are the same. But analysis of billing demand ratios is not a definitive cost analysis.

Mr. Lively relies upon Ms. Saunders' definition of billing demand.

Information Request NSTAR-JS-2-6

Referring to page 14, lines 326-330, please provide all studies, reports, and analyses that support Mr. Lively's conclusion that, given similar annual billing demand ratios, customers with DG will not incur as much cost per unit of annual maximum demand as will customers without DG.

Response

Mr. Lively has no documents in support of his analysis. For his analysis, see responses to Information Request NSTAR-JS-2-2, Information Request NSTAR-JS-2-3, and. Information Request NSTAR-JS-2-4.

Information Request NSTAR-JS-2-7

Referring to Information Request NSTAR-JS-1-18, please identify which documents provided in response to this request provide information specifically about the standby loads of DG customers.

Response

No response required, as Mr. Lively provided no documents in response to Information Request NSTAR-JS-1-18.

Mr. Lively understands that NSTAR Electric had an obligation to justify its standby rates in its direct case by presenting "information specifically about the standby loads of DG customers" that justified their being treated distinctly different from the way that NSTAR Electric treats customers without distributed generation. NSTAR Electric did not meet its affirmative obligation to present documents for Mr. Lively and others to review and identify in response to the request.

Information Request NSTAR-JS-2-8

Referring to page 15, lines 357-358, please define Mr. Lively's use of the phrase "better load research characteristics," as used in this passage.

Response

Mr. Lively uses the phrase "better load research characteristics" to refer to coincidence factors for such customers being lower than the coincidence factors for other others.

Information Request NSTAR-JS-2-9

Referring to page 15, lines 364-370, please provide the basis for the statement that "the demands placed on a distribution grid by customers with distributed generation are more likely to be associated with a random outage of the distributed generation, not weather." Provide all studies, reports and analyses to support this assertion.

Response

See response to NSTAR-JS-1-19. Also see Attachment NSTAR-JS-2-9, "Demand and Diversity Factors", *Standard Handbook for Electrical Engineers,* Eleventh Edition, Pages 14-98 through 14-99.

Attachment NSTAR-JS-2-9

"Demand and Diversity Factors",
Standard Handbook for Electrical Engineers, Eleventh Edition, Pages 14-98 through 14-99.

Demand and Diversity Factors

260. Demand Factor. The ratio of maximum demand to total load connected, expressed as a percentage, is termed the demand factor of an installation. For example, if a residence having equipment connected with a total rating of 6000 W has a maximum demand of 3300 W, it has a demand factor of 55%. Demand factors of various types of large loads are helpful in designing systems, particularly those in buildings. As an example, a single household electric clothes dryer, of course, has a demand factor of 100%, but 25 dryers in a group have a demand factor of 33%. Similarly, three to five all-electric apartments in a multifamily dwelling have a demand factor of 45%. The lower the demand factor the less system capacity required to serve the connected load. However, summer air conditioning and winter electric heating are loads that make for high demand factors.

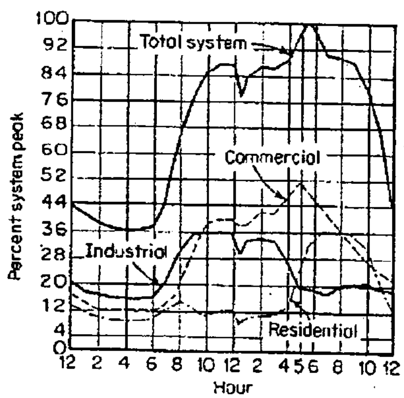

Fig. 18-67. Characteristic metropolitan load pattern.

261. Coincidence or Diversity Factor. The coincidence factor is defined as the ratio of the maximum demand of the load as a whole, measured at its supply point, to the sum of the maximum demands of the component parts of a load. The diversity factor is the reciprocal of the coincidence factor. Coincidence factors can be applied to known consumer demands for estimating the loading of distribution transformers, lines, and other facilities. Coincidence factors for residential consumers can vary over a wide range for different types of consumers. The coincidence factor for a large group of consumers with no major appliance might be as low as 30%, whereas a group of electric-heating consumers might be as high as 90%.

262. Diversity between Classes of Users. The daily-load curve of a utility is a composite of demands made by various classes of users. The load curve on the day of maximum total system peak occurs when class loads gang up to create this maximum demand for the year. This is not necessarily the day, and usually is not the day, of any particular class peak. Class load curves on the day of system peak are illustrated in Fig. 18-67.

Air-conditioning loads have shifted these curves for many systems to cause daytime peaks during hot weather in the summer. Electric house heating builds heavy morning and evening loads during cold weather in the winter.

263. Diversity in the Feeder System. The diversity of demands by transformers on a radial feeder makes the maximum load on the feeder less than the sum of the transformer loads. The diversity factors of a feeder vary greatly depending upon load conditions. Some typical diversity factors are given in Table 18-26. The diversity factor of lighting feeders ranges from 1.1 to 1.5, while that of mixed light-and-power feeders is likely to be 1.5 to 2 or more. At the substation there is also a diversity factor of 1.05 to 1.25 between the sum of feeder maxima and the substation maximum. A large system has a further diversity factor between substations of 1.05 to 1.25.

264. Total diversity factors in a large system are somewhat as in Table 18-26.

TABLE 18-26. Diversity Factors

Elements of system between which diversity factors are stated:	Diversity factors for			
	Residence lighting	Commercial lighting	General power	Large users
Between individual users	2.0	1.46	1.45	
Between transformers	1.3	1.3	1.35	1.05
Between feeders	1.15	1.15	1.15	1.05
Between substations	1.1	1.10	1.1	1.1
From users to transformer	2.0	1.46	1.44	
From users to feeder	2.6	1.90	1.95	1.15
From users to substation	3.0	2.18	2.24	1.32
From users to generating station	3.29	2.40	2.46	1.45

Distribution Economics

265. Economic Comparisons. The most straightforward and generally applicable technique to use in distribution-system investment problems is that of making economic comparisons on the basis of the present value of all future annual costs. That is, the economic choice is the one with the lowest present value of all future costs. With this as a criterion, the procedure for making an economic comparison between alternatives is a simple two-step operation, that is:

a. Estimate for each alternative the annual costs for each year.

b. If annual costs are not uniform, calculate their present value.

266. Time Value of Money. Money does have time value, and rent or interest on its use has to be paid. It is obvious that an alternative which requires the least expenditure immediately would be best, everything else being equal.

The process of taking money and finding its equivalent value at some future time is called a "future worth" or "future value" calculation. This calculation is the same as that used in determining the effect of compound interest.

If 8% is the established interest rate, then \$100 today is equivalent to \$100 $(1 + 0.08)$ or \$108 a year from now, and $100\,(1 + 0.08) + 100\,(1 + 0.08) \times 0.08 = 100\,(1 + 0.08)^2$ 2 years from now, and $100\,(1 + 0.08)^{10}$ 10 years from now. The expression $(1 + i)^n$ is called the compound amount factor, where i is the interest rate and n is the number of years. These factors and others discussed later are readily available for various interest rates and number of years in economic books such as *Principles of Engineering Economy* by Eugene L. Grant.

Hence, to find the future worth of \$100, 10 years later in the above example, first, look up the compound amount factor in the 8% interest table for year 10, then multiply it by 100. The compound amount factor for this case is 2.159 and the future worth calculates to be 100(2.159) = \$215.90.

The process of finding the equivalent value of money at some earlier time is called a "present worth" or "present value" operation.

The present worth calculation is the reverse of the future worth calculation. If \$100 today has a future worth a year from now of \$108, then we can also say that \$108 a year from now has a present worth of \$100 today. The present worth factor is the inverse of the future worth factor, and it also may be found in interest tables. Since the future worth factor for n years is $(1 + i)^n$, where i is the interest rate, the present worth factor is $1/(1 + i)^n$.

To determine the present worth, as of today, of a \$100 cost anticipated to be incurred 2 years from now where the interest rate is 8%, first the present worth factor of 0.8573 is obtained from interest tables. Then multiplying this factor by \$100 gives the present worth of \$100 (0.8573) = \$85.73.

Formulas for calculating the compound interest factors and a graphical interpretation of these factors are shown in Fig. 18-68.

267. Annual Charges. It is desirable to have a convenient method of calculating the annual costs of capital investment made in an alternative scheme. Fortunately, this can be done by using a level carrying charge which is expressed as a percentage of the original investment.

The total revenue requirements of a piece of equipment are the sum of the annual charges for:

a. Return on investment.

b. Depreciation.

Information Request NSTAR-JS-2-10

Referring to page 19 lines 454-458, please provide Mr. Lively's definition of the term "competitively dispatched" in line 455. Is Mr. Lively referring to outside control (e.g., by the utility or the independent system operator) of the customer's generator and internal load for the purpose of selling energy to the grid?

Response

Mr. Lively uses the term "competitively dispatched" to refer to the operation of a piece of generating equipment based on its costs relative to the cost of other generating equipment and turning.

Mr. Lively's definition of competitively dispatch need not include "outside control (e.g., by the utility or the independent system operator) of the customer's generator and internal load." Mr. Lively notes that most distributed generators are too small to participate in the normal "control" programs operated by most independent system operators or most utilities.

The lack of cooperation by the local utilities described in Response to NSTAR-JS-1-30 has resulted in distributed generators being forced to be dispatched against their host loads. As Mr. Lively stated in "Pricing Uninstructed Deviations to Improve Reliability" (see Attachment NSTAR-JS-1-6(a)),

> Independent Power Producers (IPPs) need incentives to improve system reliability. IPPs now generally have an incentive to operate according to schedule, even when the system is crashing down around them. This became obvious to many people after the blackout of 2003 August 14, not only in regard to active power, but especially in regard to reactive power. The Lively WOLF mechanism can provide an incentive price that increase good uninstructed deviation and decreases bad uninstructed deviations, thus improving reliability. The incentive price can be considered to be liquidated damages for uninstructed deviations.

The references to independent power producers in this passage are equally applicable to distributed generation. Indeed, the universe of independent power producers can be considered to include distributed generation. Both have strong incentives to produce according to "schedule", which for distributed generation is generally the host load. Both suffer penalties for varying from their schedule, even when such variation improves the reliability of the system.

Information Request NSTAR-JS-2-11

Referring to page 20, lines 487-493, is it Mr. Lively's position that DG investors/operators prefer tariffed terms for interruptible service as compared to negotiated service? Please explain the basis for this position and provide any notes, correspondence or other written documents that confirm this preference.

Response

Mr. Lively has not adopted a "position . . . (about whether) DG investors/operators prefer tariffed terms for interruptible service as compared to negotiated service." Mr. Lively notes that considering the number of largely undocumented distributed generators that exist in the NSTAR Electric service area, NSTAR Electric would be behooved to have a standard, tariffed process for dealing with interruptible service instead of treating it as a negotiated service.

Mr. Lively points to Attachment NSTAR-JS-1-4(h), "Saving California With Distributed Generation: A crash program to use small, standby diesel generators to keep the lights on," 2001 June 15, *Public Utilities Fortnightly*. That article identified 51,432 MW of distributed generation in the Western United States on 139,803 installed units. If NSTAR Electric has the same density of distributed generation as the Western United States, NSTAR Electric would be overwhelmed by the process of negotiating individual contracts with each of these customers.

Information Request NSTAR-JS-2-12

Referring to page 21, lines 510-512, please identify whether the referenced payments are made to DG customers in the form of reduced standby rates or are made through some other method. Please supply all documents identifying, describing and otherwise documenting the details of each referenced utility and regulatory commission that has adopted such policies.

Response

Mr. Lively spoke at a conference in San Diego, California, in 2000, during which this concept was presented by others. Mr. Lively believes that the utility was Pacific Gas & Electric, but has no specific knowledge as to whether that was the case. Mr. Lively understands that Central Hudson Gas & Electric has discussed the concept with the distributed generation industry, and may have issued a request for qualifications. Since Mr. Lively is unaware of whether any of these concepts have been put into place, he can not state the form of the referenced payments and has none of the documents requested.

Mr. Lively notes that the same avoided cost concept was developed for payments to Qualifying Facilities under PURPA. The difficulty associated with identifying the savings associated with generation deferrals led to the development of other pricing concepts, such as the Committed Unit Basis (CUB) which Mr. Lively developed for the Texas Study Group on Cogeneration and which was adopted by the CUB name by the Texas Public Utilities Commission in its regulations governing the purchase by electric utilities of power from Qualifying Facilities.

Information Request NSTAR-JS-2-13

Referring to page 24, line 590-593, is it Mr. Lively's proposal that "dynamic pricing" be mandatory for DG? If "dynamic pricing" for DG is not mandatory, would DG customers be allowed to switch back and forth from normal service to "dynamic pricing" under Mr. Lively's proposal? Please explain.

Response

Mr. Lively does not propose that dynamic pricing be mandatory for distributed generation. Mr. Lively's testimony raised a refined dynamic pricing concept only in regard to NSTAR Electric's proposal of crude dynamic pricing concept in the form of interruptible standby rates. Both proposals have prices that change in response to concurrent situations on the distribution grid. The situation in regard to NSTAR Electric's proposal is the presence of a specific call by NSTAR Electric for interruption. The situation in regard to Mr. Lively's proposal is actual loading on the electric grid and actual prices for power at local distribution stations.

As to distributed generation customers being allowed to switch between normal service and interruptible service, customers should be allowed to obtain service on any tariff that is open to them, including switching among such tariffs.

Information Request NSTAR-JS-2-14

Please provide any and all studies, reports and analyses that identify the cost of creating, implementing and operating the "dynamic pricing" proposal for DG described in Mr. Lively's testimony. From whom does Mr. Lively believe such costs should be recovered?

Response

Mr. Lively is aware of no studies, reports, or analyses that identify the cost of creating, implementing and operating a "dynamic pricing" proposal for the distribution system. Since such a pricing proposal would be applicable to any load or source on the distribution system, the cost of developing such a system would be applicable to all loads and sources on the distribution system. Specific decisions regarding such cost recovery would appropriately be decided during the proceeding to implement such a proposal.

Information Request NSTAR-JS-2-15

Referring to page 28, lines 674-690, please explain whether Mr. Lively assumes that DG operators will have automatic generator controls ("ACG") on their generators under his proposal. If not, how will the DG operators know that they should run their generators in a leading or lagging manner to "help NSTAR serve its other customers in a better manner"? Please explain.

Response

Mr. Lively has made no assumptions as to the controls on the distributed generator or how the customer operates on its side of the meter. Distributed generators already must have some form of AGC (the common abbreviation for automatic generator controls), if for no other purpose than to turn the distributed generator on and off and to match generation to load.

As to the distributed generator operating in "a leading or lagging manner to 'help NSTAR serve its other customers in a better manner'", the distributed generator will need some power electronics to control its operation in response to system conditions. In NSTAR Electric's service territory, however, the question is moot because the absence of cooperation between the utilities and the distributed generation industry means there is presently no opportunity for distributed generation to help address voltage issues, regardless the equipment and electronics installed on the generators.

Mr. Lively believes that the lack of pricing inducements for distributed generation to produce and absorb reactive power is the biggest impediment to distributed generators helping distribution companies like NSTAR Electric address local voltage issues that could be solved most economically by the operation of existing distributed generation to produce leading (voltage raising) or lagging (voltage reducing) power.

Information Request NSTAR-JS-2-16

Referring to page 29, lines 703-715, please identify the size of the DG facility at the University of California mentioned by Mr. Lively. Please explain how the DG operator is notified that SMUD has low voltage problems in that part of town? How is the DG compensated for producing or absorbing reactive power at SMUD's request? Please explain how this level of compensation is determined. Please provide a copy of any and all documents relating to this response.

Response

Mr. Lively understands that

- The distributed generation facility is about 30 MW
- SMUD operators use telephones to request assistance by the University of California; and
- No compensation is provided.

The documents Attachment NSTAR-JS-2-16(a), (b), and (c) represent an exchange of electronic mails between Mr. Lively and his contact at SMUD and are the only documents he possesses that relate to this response.

Attachment NSTAR-JS-2-16(a)

Electronic mail dated 3/12/2004 from Mr. Lively to his contact at SMUD in regard to the University of California distributed generation equipment.

Subj: **Distributed Generation**
Date: 3/12/2004 11:48:16 AM Eastern Standard Time
From: MbeLively
To: [redacted]@smud.org

[redacted]

I have been asked to testify in Boston on distributed generation. One of the points that I want to make is that DG can help with voltage stability, such as you described with UC Davis (?) med school. What can you provide me about this?

Mark B. Lively
Utility Economic Engineer
19012 High Point Dr.
Gaithersburg, Md. 20879
301-428-3618 (voice and fax)
www.LivelyUtility.com

Attachment NSTAR-JS-2-16(b)

Electronic mail dated 3/19/2004 from Mr. Lively to his contact at SMUD in regard to the University of California distributed generation equipment.

Subj: **Testimony in Boston**
Date: 3/19/2004 3:39:06 PM Eastern Standard Time
From: MbeLively
To: [redacted]@smud.org

[redacted]

Thanks for returning my call. I got an assignment last Friday to file testimony four days later in NSTAR Electric (Boston Edison, et al.) on its standby charge tariff. I was to talk about benefits of distributed generation. I attach a copy of my filed testimony. I talk about your good relations with UC Davis on page 29. I hope I did not missate anything.

Mark B. Lively
Utility Economic Engineer
19012 High Point Dr.
Gaithersburg, Md. 20879
301-428-3618 (voice and fax)
www.LivelyUtility.com

Attachment NSTAR-JS-2-16(c)

Electronic mail dated 3/25/2004 to Mr. Lively from his contact at SMUD in regard to the University of California distributed generation equipment.

Subj: **RE: Testimony in Boston**
Date: 3/25/2004 11:50:22 AM Eastern Standard Time
From: [redacted]@smud.org
To: MbeLively@aol.com

Mark
I have finally had a chance to read you testimony. The only caveat I would raise is that the UCD Project is more like a conventional generator. It is a Co-gen arrangement with an LM2500 CT with a 4 MW Steam generator. As a result it is built like a conventional generation facilities with the ability to adjust the excitation current to vary the PF of the generation. This project is just like the 500 Mw project we are building, just smaller. If you are questioned on this you might have difficulty defending the idea that the UCD is a project that falls in the category of Distributed Generation, at least as it is defined today.

Having said that, your conclusions are correct in that placement of generation at the right spot, even with unity PF, will help the voltage of the system.

Good luck with your testimony.

Thanks [redacted]

-----Original Message-----
From: MbeLively@aol.com [mailto:MbeLively@aol.com]
Sent: Friday, March 19, 2004 12:39 PM
To: [redacted]@smud.org
Subject: Testimony in Boston

[redacted]

Thanks for returning my call. I got an assignment last Friday to file testimony four days later in NSTAR Electric (Boston Edison, et al.) on its standby charge tariff. I was to talk about benefits of distributed generation. I attach a copy of my filed testimony. I talk about your good relations with UC Davis on page 29. I hope I did not missate anything.

Mark B. Lively
Utility Economic Engineer
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www.LivelyUtility.com

Information Request NSTAR-JS-2-17

Referring to Exhibit Joint Supporters-DH-2, please provide all workpapers, including all calculations, data and assumptions adopted for purposes of developing the information provided in this exhibit.

Response

Mr. Hannus has no workpapers from the preparation of DH-2.

CERTIFICATE OF SERVICE

I, Bruce S. Barnett, hereby certify that I served the foregoing Response of the Joint Supporters to NSTAR Electric Second Set of Information Requests to the Joint Supporters on all parties of record in this proceeding this 8th day of April 2004.

Bruce S. Barnett

Bruce S. Barnett